

Opioid-induced Sedation: Its Relationship to Respiratory Depression

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Opioid-induced Sedation

- Common opioid adverse effect
- Underlying mechanisms poorly understood
- No agreed-upon definition
- Lack of consistency in monitoring and reporting
- Highly sensitive indicator of impending respiratory depression

Consciousness

- Arousal domain
 - Fluctuations between awake and sleep states
 - Mediated by reticular formation in medulla
 - Thalamus responds to sensory input
- Content domain
 - Quality features, e.g., sensation, thought, speech, imagination

Young-McCaughan, Miaskowski. (2001). Pain Manage Nurs 2(3):84-97

Opioid-induced Sedation: Suggested Mechanisms

- Opioids interfere with sleep/wake cycle
 - Disrupt REM sleep
 - Decrease responsiveness to sensory input induces sleep
 - Prolong sleep time
- Clinical presentation
 - Drowsy → → → Somnolence

Young-McCaughan, Miaskowski. (2001). Pain Manage Nurs 2(3):84-97

References

Ely et al (2003). Monitoring sedation status over time in ICU patients: Reliability and validity of the Richmond Agitation Sedation Scale (RASS). *JAMA* 289(22), 2983-2995.

McCaffery, M. & Pasero, C (1999). *Pain: Clinical Manual*. St. Louis, Missouri: Mosby.

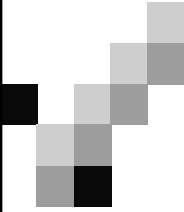
Pasero, C & McCaffery M (2002). Monitoring Sedation: It's the key to preventing opioid-induced respiratory depression. *AJN* 102(2):67-69.

Pasero C, Eksterowicz N, McCaffery M. (2009). The nurse's perspective in acute pain management. In R Sinatra, O de Leon Casasola, E Viscusi, B Ginsberg (Eds), *Acute Pain Management*. New York, Cambridge University Press.

Quinn, T (2006, March). Respiratory depression: Should we really be so nervous? Presented at the 2006 Annual Meeting of the American Society of Pain Management Nurses (ASPMN), Orlando, Florida.

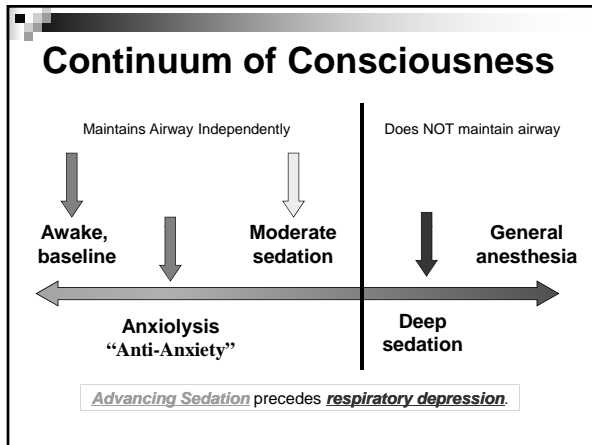
Sessler, CN et al (2002). The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. *American Journal of Respiratory & Critical Care Medicine*. (31), 2344-2354.

Young-McCaughan S, Miaskowski C. (2001). Definition of and mechanism for opioid-induced sedation. *Pain Manage Nurs* 2(3):84-97



Post-opioid Sedation Assessment Scales

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Why Post-opioid Sedation Assessment?

- System sedation assessment tool not previously validated (internally developed)
- Minimal use of a common "language of sedation" noted
 - Hand-off communications
 - Escalation of clinical issues
- Support clinical decision-making; appropriate and timely escalation of care
- Enhance patient safety

Why Post-opioid Sedation Assessment?

- Sedation assessment tools identified in the literature had not yet been studied for validity or reliability for use by non-critical care nurses with adult medical-surgical patients
 - Richmond Agitation & Sedation Scale (RASS)
 - Pasero Post-Opioid Sedation Assessment Scale (POSS)

Why Post-opioid Sedation Assessment?

- Sedation assessment tools validated in the literature were developed in critical care settings:
 - Measure agitation in addition to sedation in relation to the titration of sedative agents; not opioids (Sessler, 2002 & Ely, 2003)
 - Noted to be inappropriate to measure in post-opioid analgesic sedation assessment (Pasero & McCaffery, 2002; Quinn, 2006)

Goal of Post-opioid Sedation Assessments

Identify advancing sedation before it is compounded by continued opioid administration and results in clinically significant respiratory depression or apnea, **thereby enhancing patient safety** during pain management with opioid analgesics

Outcomes

- Safely managed opioid analgesia
 - Early identification of developing problems
 - Responsive titration of therapy
 - Appropriate escalation of care
- Accuracy and clarity of communications
 - Across teams
 - Across departments
 - “speak the same language”

Study Methodology

- Online anonymous survey (Survey Monkey®)
 - 25 items – Evaluating responses to three sedation scales
 - Demographic Information (6 questions)
 - 6 questions/scale (18)
 - One knowledge question (1)
 - Open for 30 days on InovaNET
 - Incentive:
 - Certificate of participation
 - Candy (always a good idea!)
 - Pre-validated by panel of experts
 - 10 internal
 - 10 external
 - 15 responded to invitation (blinded)

Inova Sedation Assessment Scale

Inova Sedation Assessment Scale

ISS

- 1 - Alert
- 2 - Occasionally drowsy, easy to rouse
- 3 - Dozing intermittently
- 4 - Asleep, easy to awaken
- 5 - Difficult to awaken
- 6 - Unresponsive

(Inova Health System, 1991)

Richmond Agitation & Sedation Scale (RASS)

+4	Combative	violent, immediate danger to staff
+3	Very Agitated	Pulls or removes tube(s) or catheter(s); aggressive
+2	Agitated	Frequent non-purposeful movement, fights ventilator
+1	Restless	Anxious, apprehensive but movements not aggressive or vigorous
0	Alert & calm	
-1	Drowsy	Not fully alert, but has sustained awakening to voice (eye opening & contact ≥ 10 sec)
-2	Light sedation	Briefly awakens to voice (eye opening & contact < 10 sec)
-3	Moderate sedation	Movement or eye-opening to voice (but no eye contact)
-4	Deep sedation	No response to voice, but movement or eye opening to physical stimulation
-5	Unarousable	No response to voice or physical stimulation

Sessler, 2002

Pasero Opioid-induced Sedation Scale (POSS)

S = Sleep, easy to arouse
Acceptable; no action necessary; may increase opioid dose if needed

1 = Awake and alert
Acceptable; no action necessary; may increase opioid dose if needed

2 = Slightly drowsy, easily aroused
Acceptable; no action necessary; may increase opioid dose if needed

3 = Frequently drowsy, arousable, drifts off to sleep during conversation
Unacceptable; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory; decrease opioid dose 25% to 50%¹ or notify prescriber² or anesthesiologist for orders; consider administering a non-sedating, opioid-sparing nonopioid, such as acetaminophen or a NSAID, if not contraindicated.

4 = Somnolent, minimal or no response to verbal and physical stimulation
Unacceptable; stop opioid; consider administering naloxone^{3,4}; notify prescriber² or anesthesiologist; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory.

Copyright 1994, Chris Pasero. Used with permission. Source: Pasero C. Acute Pain Service: Policy and Procedure Manual. Los Angeles, CA Academy Medical Systems, 1994. Reprinted with permission.

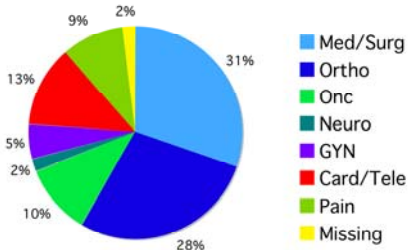
Research Questions

1. What is the content validity and reliability of the three scales?
2. Is there a significant difference in accuracy of scoring & clinical decision-making between scales?
3. Is there a significant difference in the nurse's combined rating of each scale's"
 - Ease of use
 - Confidence (in score & actions chosen)
 - Useful information provided to make clinical decisions

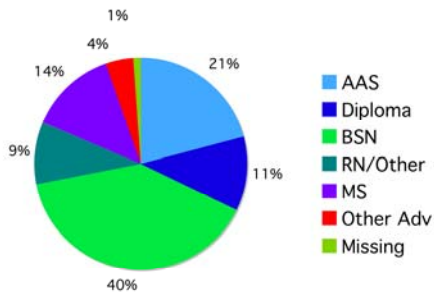
Sample

- 10% sample of Medical-Surgical Nurses
 - Excluded: Peri-op; critical care; peds
 - Desired: 53
 - Obtained: 96

Sample: Clinical Area



Sample: Education



Data Analysis

- Content Validity: established by Panel of Expert review of overall study tool & subscales relating to each sedation assessment scale
- Scale Reliability: Cronbach's alpha: > 0.7 α acceptable internal consistency of the subscale (4 items rating scale)

Validity

- All tools have been used in practice and have face validity
- Content validity and established by Panel of 15 content experts
 - RASS
 - POSS
- ISS was felt by some panel members not to discriminate advancing sedation well enough to validate content.

Reliability

Scale	Cronbach's Alpha	% Correct Score	% Correct Actions
ISS	.803*	46.9	67.7
RASS	.770*	76	68.8
POSS	.903*	79.2	80.2

* Indicates acceptable reliability

Data Analysis

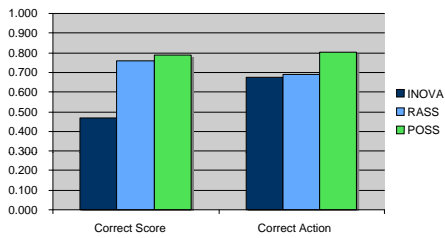
- 2 Paired sample T Tests to measure significance of observed means ($p < 0.05$):

ISS:RASS and RASS:POSS

- Total Correct (RN: score & actions)
- Total Scale Rating (ease of use, information provides, confidence in score, confidence in actions)

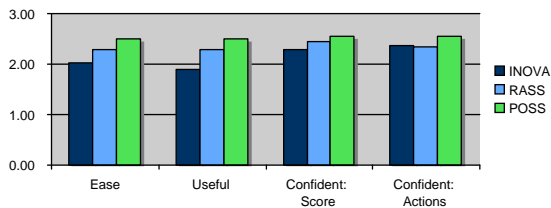
Method of pairing accounts for rater learning as study questions progress.

Means Observed



Paired Samples t Test	Mean (Std.Dev)	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2 tailed)
			Lower	Upper			
Total Correct INOVA:RASS (.664)	-.292	.068	-.426	-.157	-4.306	95	.000*
Total Correct RASS:POSS	-.146 (.711)	.073	-.290	-.002	-2.011	95	.047*

Means Observed



Paired Samples t Test	Mean (Std.Dev)	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2 tailed)
			Lower	Upper			
Total Rating INOVA:RASS (2.01)	-.813	.205	-1.22	-.405	-3.96	95	.000*
Total Rating RASS:POSS	-.750 (2.05)	.209	-1.17	-.335	-3.59	95	.001*

Summary results

- RASS & POSS content validity established
 - ISS – not enough discrimination between scale items to indicate advancing sedation
- All scales reliable in this sample;
 - POSS > Highest Reliability (0.903)
 - ISS Were results skewed by familiarity with the tool?
 - Not valid; Lowest consistency in correct score
- POSS > Most frequently correct
 - Sedation score (.790; range 0-1)
 - Nursing Actions chosen (.802; range 0-1)
- POSS > Nurses rated higher
 - rated more frequently as easy to use (2.49; range 0-3)
 - providing useful information to make clinical decisions (2.51)
 - resulting in confidence
 - score obtained (2.55)
 - actions chosen (2.56)

Take Home

- ISS cannot be recommended for continued use
 - Poor content validity; found reliable in this population?
 - Familiarity with the tool
 - Poor consistency in accurate score
 - Lowest consistency in correct actions
- POSS/RASS can be recommended for use in non-critical care setting with adult patients
 - POSS superior scale:
 - Better performance
 - Does not measure constructs other than sedation (agitation), which is desirable for post-opioid sedation assessment

Based on my understanding of opioid side effects, I know that...

- A. Sedation follows respiratory depression
- B. Sedation precedes respiratory depression
- C. Sedation and respiratory depression are unrelated side effects
- D. I am not sure.

Based on my understanding of opioid side effects, I know that...

- A. Sedation follows respiratory depression (10.5%)
- B. Sedation precedes respiratory depression (85.3% - correct)**
- C. Sedation and respiratory depression are unrelated side effects (2.1%)
- D. I am not sure. (2.1%)

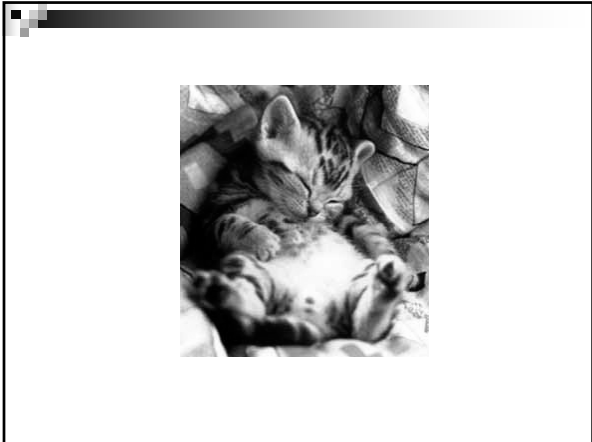
Survey Responses, 2008

Results Sharing/Process change

- Revisions to the Pain Flow Sheet
- Revisions to online documentation pages
- Share research results
 - Education
 - Internal Presentations
 - Online annual Safety Fair
 - Poster sessions, local, regional, national
 - In Press – September PMN
- Goal: Enhanced patient safety
 - Develop monitoring process to capture outcomes

Future Research

- Research in other non-critical care populations
 - Pediatric
 - Procedural sedation
 - Comparison: does reporting in this setting require agitation dimension?



References

Ely et al (2003). Monitoring sedation status over time in ICU patients: Reliability and validity of the Richmond Agitation Sedation Scale (RASS). *JAMA* 289(22), 2983-2999.

McCaffery, M, & Pasero, C (1999). *Pain: Clinical Manual*. St. Louis, Missouri: Mosby.

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Selection of a Sedation Assessment Scale for Clinical Practice: Inter-rater Reliability, Ease of Use and Applicability Testing of the RASS and POSS


Susan J. Dempsey, MN, RN-BC, CNS
Judy Davidson, DNP, RN, CNS
Donna Cahill, MSN, RN-BC, CNS
Donna Agan, EdD

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Five Hospital Campuses



Scripps Memorial Hospital Encinitas




Scripps Mercy Hospital (San Diego Campus)






Scripps Green Hospital



Scripps Mercy Hospital (Chula Vista Campus)



Scripps Memorial Hospital La Jolla

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By the Numbers

By the Numbers

- 2 accredited trauma centers
- 3 Scripps Mercy Medical Group locations
- 5 hospital campuses
- 10 Scripps Clinic locations
- 100 new clinical trials annually
- Number of medical residents/fellows 131
- 236 wings and 4.1 million sq. feet of office space
- Average daily patient census 855
- 1,254 total licensed acute care beds
- 2,600 affiliated physicians
- 10,000 babies born annually
- 11,000 employees
- 64,000 cardiac procedures annually
- 118,000 emergency department visits annually
- 1,577,000 patient visits annually
- \$173 million emergency health services provided annually
- \$1.8 billion annual revenue

- **Two of San Diego's six trauma centers**
- 1,254 total licensed acute care beds
- **12,000 employees**
- **2,600 physicians**
- 131 residents and fellows
- 1,500 volunteers
- 1.5 million patient visits annually
- **118,000 visits a year to our emergency departments**

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Corporate Profile

- Private, Not-for-Profit Corporation
- Board of community volunteers
- 1,368 total licensed beds
- 2,600 Physicians & 136 residents/fellows
- Two of San Diego's six trauma centers
- 12,500 employees, including 3,000 registered nurses
- Integrated Delivery System

- Other programs/services include:
 - Home Health
 - Chemical Dependency
 - Executive Health
 - Center for Integrative Medicine
 - Whittier Institute for Diabetes
 - Graduate Medical Education
 - Clinical Research
 - Scripps Health Foundation



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Significance of the Problem

- All patients receiving opioids for pain management are at risk for sedation that may progress to oversedation and lead to clinically significant opioid-induced respiratory depression
 - Sedation *always* precedes respiratory depression.**
- Sedation Scales that correlate behaviors to sedation level often are used to assess sedation regardless of desired patient outcome
- Assessment using a sedation scale which identifies changes in alertness and arousability is critical to prevention of opioid-induced respiratory depression

Pasero C & McCaffery M. AJN. 2002;102(2): 67-69

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Purpose of the Study

- Answer the Question
 - Is the Richmond-Agitation-Sedation Scale (RASS) or the Pasero Opioid-Induced Sedation Scale (POSS) more appropriate for sedation assessment in patients receiving opioids for pain management?
- Select a Sedation Scale for clinical practice and inclusion in the electronic medical record system (EMR)
- Conduct psychometric testing of the POSS
- Conduct ease of use and applicability testing of the RASS and POSS

Scripps Richmond Agitation-Sedation Scale
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Score	Term	Description
+4	Combative	Overtly combative or violent; Immediate danger to staff
+3	Very agitated	Pulls or removes tubes(s) or catheters(s) or has aggressive behavior toward staff
+2	Agitated	Frequent nonpurposeful movement or patient-ventilator dyssynchrony
+1	Restless	Anxious or apprehensive but movements not aggressive or vigorous
0	Alert and calm	
-1	Drowsy	Not fully alert, but has sustained (more than 10 seconds) awakening, with eye contact to voice
-2	Light Sedation	Briefly (less than 10 seconds) awakens with eye contact to voice
-3	Moderate Sedation	Any movement (but no eye contact) to voice
-4	Deep Sedation	No response to voice, but any movement to physical stimulation
-5	Unarousable	No response to voice or physical stimulation

Sessler, CN, et al. Am J Resp Crit Care Med. 2002;166(31): 1338-1344

Scripps Pasero Opioid-Induced Sedation Scale
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- **S = Sleep, easy to arouse**
 - Acceptable, no action necessary, may increase opioid dose if needed
- **1 = Awake and alert**
 - Acceptable, no action necessary, may increase opioid dose if needed
- **2 = Slightly drowsy, easily aroused**
 - Acceptable, no action necessary, may increase opioid dose if needed
- **3 = Frequently drowsy, arousable, drifts off to sleep during conversation**
 - Unacceptable; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory, decrease opioid dose 25-50%, notify prescriber for orders, consider addition of a non-sedating, opioid-sparing analgesic
- **4 = Somnolent, minimal or no response to physical stimulation**
 - Unacceptable; monitor respiratory status and sedation level closely until sedation level is stable at less than 3 and respiratory status is satisfactory, decrease opioid dose 25-50%, notify prescriber for orders, consider addition of a non-sedating, opioid-sparing analgesic

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Scripps Description of the Study
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- IRB approval as exempt
- Authors of both scales were contacted to verify content validity of scales modified for inclusion in the EMR system
- Design
 - Exploratory descriptive to determine ease of use and applicability
 - Psychometrics to determine inter-rater reliability
- Sample
 - Convenience sample (84 patients)
- Patient Population
 - All inpatients located in Critical Care and Medical-Surgical Units during the selected study days

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Description of the Study

- Brief explanation was provided to patient's RN to simulate "real-time" inservice during clinical practice
- 3 Researchers performed sedation assessment using the RASS and POSS.
 - Expert: Clinical nurse specialist
 - Reference rater: RN from pain committee
 - Clinical Nurse: RN caring for the patient
- Every RN who participated in the study completed an ease of use and applicability survey

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Results

- Reliability of both scales was very high
 - POSS .909; RASS .949
- 76% rated the POSS as easiest to use
- 49% rated the POSS and 51% rated the RASS as applicable to the majority of their patients
- 49% requested POSS be available for patients receiving opioids for pain management and RASS be available for goal-directed sedation
- Other options were split much lower
 - POSS only 19%; RASS only 23%
 - POSS in Med-Surg and RASS in ICU 8%

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Results

- With brief clinical practice inservice, RNs were able to discern the difference between the intended use of both scales and selected both for practice based on desired patient outcome
- Study results and clinical nurse recommendations determined sedation scale selection
- RN feedback was used in a scientific method to identify how to construct the EMR

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Significance

- Both the POSS and RASS were included in the EMR system
- POSS is used when the desired patient outcome is prevention of sedation
- RASS is used when the desired patient outcome is goal-directed sedation
- Both sedation scales were incorporated in the Scripps Healthcare Pain Policy
- All nurses in every patient care area perform sedation assessment as determined by desired patient outcome

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Pain / Sedation Flowsheet

Pain Assessment

Location: GENERAL Pain Note

Characteristics: _____

Frequency: _____

Pain Tool: _____

Current Pain Level: _____

(Default: Frequency Goal) _____

+4 - Combative/Violent/Danger to Self/Others
 +3 - Very Agitated, Pulls Tubes, Aggressive
 +2 - Agitated Non/Purposeful Movement/Fight/Vent
 +1 - Restless/Anxious/Movement Not Aggressive
 0 - Alert and Calm
 -1 - Eyes Open to Voice, Eye Contact > 10sec
 -2 - Eyes Open to Voice, Eye Contact < 10sec
 -3 - Any Movement to Voice, No Eye Contact
 -4 - Any Movement to Physical Stim, Not Voice
 -5 - Unresponsive to Voice or Physical Stim

on Scale: _____ POSS Help

PASS Sedation Score: _____ POSS Sedation Level: _____


Save Skip Cancel

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Recommendations for Practice

- Perform routine sedation assessment for ***all*** patients receiving opioids for pain management to identify oversedation and prevent opioid-induced respiratory depression
- Select sedation assessment scales based on desired patient outcome
- Conduct psychometric testing of scales when modified for EMR systems
- Consult authors of scales when considering scale modification to ensure that content validity is maintained
- Involve clinical nurses in research and decisions which impact clinical practice


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**Expert Consensus Panel for
Monitoring of Opioid-induced
Sedation and Respiratory Depression:**


**Summary of Findings from a Practice
Analysis on Sedation and Respiratory
Monitoring Practices**

Donna Jarzyna RN-C, MS, CNS-BC
University Medical Center
Tucson, Arizona



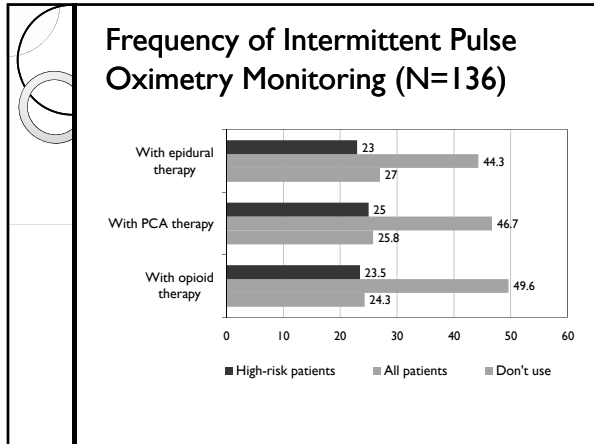
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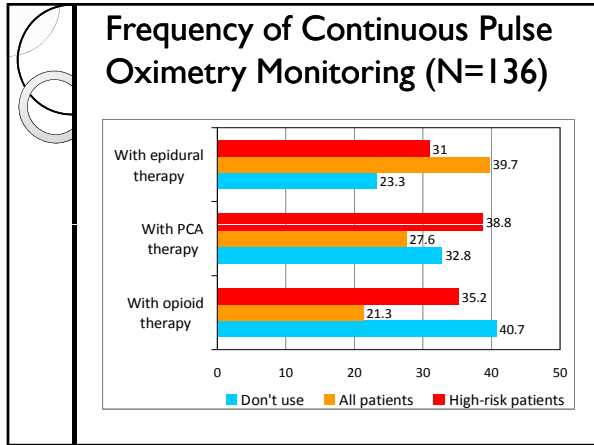
- The ASPMN Expert Consensus Panel values the opinions and experience of its members in understanding the state of current practice
- An internet-based practice survey of ASPMN members and nurses who are part of the ASPMN listserv was conducted using Survey Monkey from January to February 2009
- Potential respondents received notification of the survey by e-mail and postings on the ASPMN web site and in the Pathways newsletter
- Respondents (N=147) provided a data source for evaluating sedation and respiratory depression monitoring practices

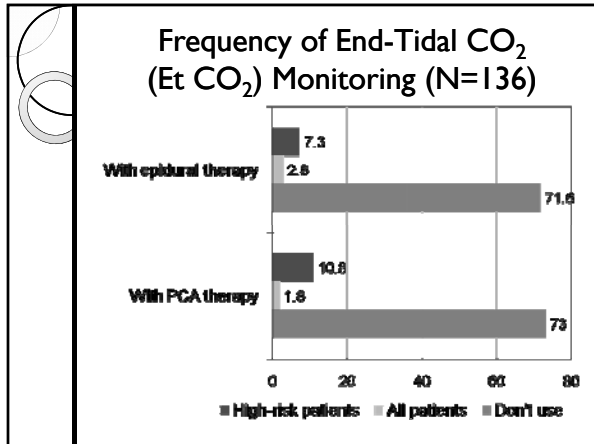


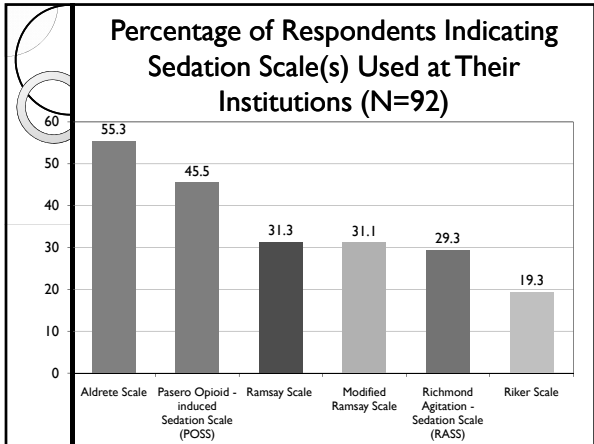
Specific Aims

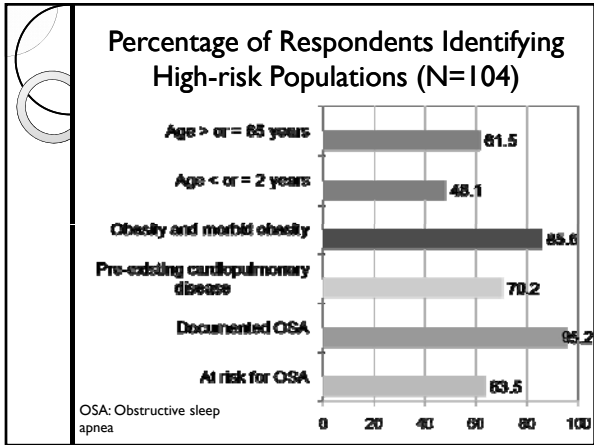
- Examine current sedation and respiratory monitoring practices for non-critical care, adult, hospitalized patients
- Identify populations at high-risk for sedation and respiratory depression with pain therapies
- Investigate policies, procedures and guidelines, and accountability for quality improvement activities related to sedation and respiratory depression outcomes





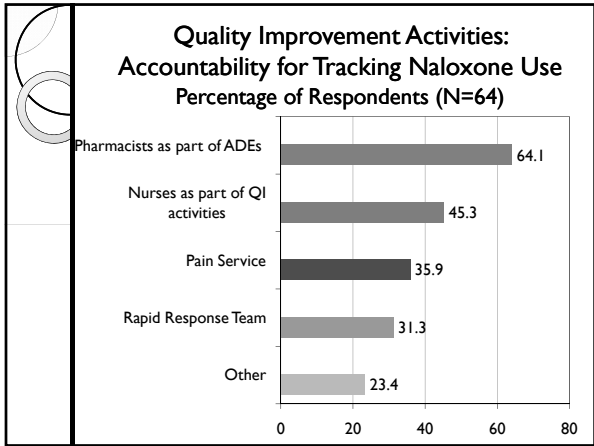






Practice Policies and Guidelines

- 45.6 % of respondents (n=49) indicated high-risk populations are identified in practice policies for epidural and PCA therapy
- 42.4% (n=53) define respiratory depression < 8 respirations per minute, and 31.2% (n=39) < 10
- Examples were provided for guidelines or protocols to decrease the risk of respiratory depression



Summary

- Findings from this survey will be used to support guidelines and recommendations for practice
- Plans are underway to prepare a full report and publish results for the ASPMN membership
- The ASPMN Expert Consensus Panel for Monitoring of Opioid-induced Sedation and Respiratory Depression wishes to thank those who responded to this survey
